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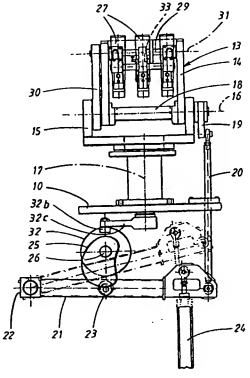
(54) Title: METHOD AND ARRANGEMENT FOR TRANSFERRING PACKAGING CONTAINERS FROM A FIRST UNIT TO A SECOND UNIT

(57) Abstract

The invention relates to a synchronizing method and transfer arrangement for synchronizing the patterns of movement between two units included in a packaging line, where one unit is driven intermittently and the other continuously. The invention relates in particular to a transfer arrangement between an intermittently operating tube filler and a continuously operating cartoning machine. The transfer arrangement has a frame arrangement (13) intended to support tube pickers/placers (28) and arranged for a pivoting movement about a horizontal axis (16) and for a turning movement about a vertical axis (17). The turning movement about the axis (17) gives an acceleration course for the frame in a position in front of the tube release station, and this turning movement generating acceleration is obtained by means of an axially acting cam guide (32). The latter is designed so that the tube pickers/placers in the release position are given the same speed as the case conveyor of the cartoning machine.



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TITLE

Method and arrangement for transferring packaging containers from a first unit to a second unit

FIELD OF THE INVENTION

The invention relates to a method and an arrangement for transferring packaging containers, in particular packaging tubes, from a first unit operating intermittently in a first horizontal path to a second unit operating continuously in a second horizontal path.

The invention relates in particular to a method and arrangement for transferring filled tubes from a tube filler, operating in a horizontal circular path and provided with a plurality of filling nozzles, to a continuously operating cartoning machine.

PRIOR ART

It has for many years been known to handle packaging containers, and in particular packaging tubes, using the so-called pick-and-place principle. This principle is used, for example, for collecting packaging tubes downstream of a filler, and the principle is applied in such a way that the tubes, downstream of the filler, are placed in a so-called "stepped conveyor", i.e. a belt provided with a number of cases.

To be able to handle a continuously operating conveyor belt with these cases, some form of transfer arrangement is needed which can handle the transition between intermittent feeding of packaging containers and continuous feeding.

A method for doing this is the so-called drop-flap principle. In this, a flap device is inserted between a conveyor belt serving as buffer belt, in which packaging containers are continuously fed with a certain spacing between them, and a continuously operating conveyor belt provided with "cases". To be able to drop the packaging containers into the associated cases on the continuously driven belt, precise control of the flaps is required so that these are opened at the correct moment and a tube falls into the correct case. This method is relatively common, but it has the inherent disadvantage that one has to rely on gravity, and in addition to this the arrangement is such that friction always remains an uncertain factor.

Another principle is based on a "rotating drum". A drum provided with suitable recesses corresponding to the container shape is in this case inserted between a delivery conveyor, on which tubes are advanced with a certain spacing between them, and a "case conveyor". The conveyor provided with cases is arranged under this drum, and the speed of rotation of the rotating drum is adapted in such a way that as soon as one of the recesses is situated over a case, a packaging container drops into the case.

PROBLEM ON WHICH THE INVENTION IS BASED

The trend in the packaging machines sector is towards ever higher production capacity and thus higher speeds. A specific problem in this connection is the inadequacy of known transfer arrangements, for example of the above-mentioned type, where during the transfer phase from one unit to another, for example from filler to cartoning machine, there is insufficient control of the packaging container. The gravitation principle can of course be used for insertion into the respective case, but during the actual transfer phase problems may arise due to the fact that the packaging containers are not continuously and positively gripped.

The object of the invention is therefore to make available a solution in which this disadvantage is eliminated, and which solution can be generally applied for synchronizing the transfer of packaging containers from one movement path to another with complete control, and gripping of the containers throughout the entire transfer phase.

THE INVENTION

The object of the invention is achieved by means of a method and an arrangement as specified in attached Patent Claims 1 and 12, respectively.

DESCRIPTION OF THE DRAWINGS

Fig. 1 shows, in a partial perspective view, from the side, a transfer arrangement according to the invention in position for picking up tubes (not shown) from an intermittently operating filler,

Fig. 2 shows the transfer arrangement from Figure 1 in a partial perspective view, seen from above, and in the position according to Figure 1,

Fig. 3 shows the transfer arrangement in position for releasing tubes to a continuously driven conveyor in a cartoning machine,

Fig. 4 is a diagrammatic outline view showing the main components of the transfer arrangement,

Fig. 5 is a diagrammatic outline view showing the transfer arrangement in position for picking up tubes in a tube filler,

Fig. 6 shows the transfer arrangement from Figure 5, seen from the side.

Fig. 7 shows the transfer arrangement in an intermediate position, with the frame arrangement which holds the filled tubes in a position ready for acceleration movement,

Fig. 8 shows the transfer arrangement from Figure 7, seen from the side,

Fig. 9 shows the transfer arrangement pivoted forwards to the conveyor of the cartoning machine, with the tubes accelerated to the conveyor's speed and horizontally oriented with the correct mutual spacing for placement in cases on the conveyor,

Fig. 10 shows the transfer arrangement from Figure 9, seen from the side,

Fig. 11 shows the transfer arrangement in an intermediate position, on the way back towards the pick-up position, with the frame arrangement now without tubes, at the end of a deceleration phase, and

Fig. 12 shows the transfer arrangement from Figure 11, seen from the side.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring first to Figure 4, the main components of a transfer arrangement according to the invention are shown here. The transfer arrangement is supported on a machine stand 10 at a suitable distance between an intermittently operating filler (Fig. 5) and a continuously operating so-called case conveyor 12 (Fig. 9) in a cartoning machine. Supported on the stand 10, there is a frame arrangement 13 which comprises a first frame 14 and a second frame 15. The frame 14 can pivot about a pivot axis 16, and the frame 15 can turn about an axis of rotation 17.

To generate the pivoting of the frame 14 about the pivot axis 16, the frame 14 is fixed in terms of rotation on a shaft 18 mounted in the frame 15. Arranged

in a rotationally fixed manner on this shaft 18, there is an arm 19 which is connected to an articulated rod 20. The other end of the articulated rod is connected to a cam follower arm 21 which at its other end is mounted in a bearing 22 in the machine stand. On the cam follower arm there is a cam follower roller 23, and a piston/cylinder 24 acting with a spring force loads the arm 21 and the cam follower roller 23 against a cam plate 25 which in turn is fixed in terms of rotation on a drive shaft 26. As will be seen from the figure, the cam plate 25 acts peripherally, and its peripheral design generates, upon rotation of the shaft 26, a reciprocating movement of the cam follower arm 21 between the position indicated by continuous lines and the position indicated by broken lines, and this in turn results in upward and downward movement of the articulated rod 20 and thus a reciprocating rotational movement of the shaft 18 and the frame 14 secured thereon.

Figure 4 shows three tubes 27 mounted in a rotationally fixed manner on a shaft 29 of a tube picker/placer 28 (Fig. 5). The shaft 29 is driven by a cam belt 30 and acquires its reciprocating rotational movement from the shaft 18 driven by the articulated rod 20. The tube pickers/placers 28 on the shaft 29 execute a pivoting movement to and fro about the pivot axis 31.

During the pivoting movement forwards to the tube release position and back to the tube pick-up position, the tubes are thus given a pivoting movement which is determined by a combination of the pivoting movement of the frame 14 and the pivoting movement of the tube pickers/placers about the pivot axis 31, obtained from the driving of the shaft 29 by the cam belt 30. By designing the radially acting cam plate 25 in a corresponding manner, and by using the articulated rod 20 to give the shaft 18 the necessary turning movement and thus the cam belt 30 the appropriate transmission ratio, the whole set-up is such that by means of the pivoting movement, or tilting movement, of the frame arrangement 14, the tubes 27 are picked up in a vertical position in the tube filler and these tubes are delivered horizontally to the conveyor of the cartoning machine (Fig. 9).

In addition to the described pivoting or tilting movement of the frame 14 and the tube pickers/ placers 28, an arrangement is provided for limited turning of the frame 15 about the axis of rotation 17, which, as can be seen from figure 4, is oriented vertically and centrally in the transfer arrangement. Arranged for this purpose on the drive shaft 26, there is a further cam plate 32 which is of the axially acting type (see Fig. 8, for example). Running in the cam plate track 32a provided for specific movement, there is a cam follower roller 32b which is arranged on an arm 32c connected in a rotationally fixed manner to a shaft (not shown) arranged in a rotationally fixed manner in the frame 15, in order, during movement of the arm 32c in the track 32a, to give the frame 15 a reciprocating rotational movement about the axis of rotation 17.

Thus, as will be described below, during the pivoting or tilting movement of the frame arrangement 13, a turning movement about the axis of rotation 17 is superimposed on the pattern of movement, and this turning movement plays an important part in this context. In fact, during the continuous pivoting of the frame 13 from pick-up position to release position, it is possible by this means to create an acceleration course for the tube pickers/placers at exactly the right moment, namely immediately before the tubes are to be released to the continuously driven conveyor in the cartoning machine. It has in fact been found in practice that by suitable design of the axially acting cam track arrangement 32a in the cam plate 32 and by corresponding adaptation of the arm 32c, a moderate acceleration course is sufficient to synchronize the movements. Fig. 7 shows, for example, a 5° turn of the frame arrangement 13 for generating an acceleration course to the cartoning machine which, in the example shown, delivers 300 tubes per minute (3 tube pickers/ placers).

In addition to this acceleration, however, it is also necessary to be able to handle the positions of the tube pickers/placers on the shaft 29 all the way from the pick-up position (Fig. 5) to the release position. In the illustrative embodiment shown in the drawings, filled tubes are in fact picked up from a

embodiment shown in the drawings, filled tubes are in fact picked up from a partially circular path (Fig. 5) in the tube filler and released to a straight path. In addition, the spacing between adjacent tubes on the partially circular path differs from the spacing between adjacent tubes which is defined by the cases on the conveyor 12.

In the illustrative embodiment shown in the drawings, there are three tube pickers/placers on the shaft 29, and the whole set-up is arranged in such a way that the central tube picker/placer is fixed centrally on the shaft 29 while the outer pickers/ placers can be moved along the shaft 29. The length of the outer pickers/placers viewed from the shaft 29 and radially outwards is constant and adapted to the prevailing machine parameters in order to permit the described transfer movement. By contrast, the central picker/placer is articulated about a shaft 33 parallel to the shaft 29. In the pick-up position according to Figure 5, the central picker/placer will in fact have a shorter length than it does in the release position according to Figure 9, where all the pickers/placers have the same radial extent viewed from the shaft 29. This articulation 33 is controlled from a fixed cam arrangement (not shown) during the turning of the shaft 29.

In order also to control the necessary axial displacement of the outer pickers/placers, these are arranged in axially acting cam guides 34 fixed in terms of rotation on the shaft 29 (Fig. 5). During the turning of the shaft 29 by means of the cam belt 30, the axially acting guides 34 move the outer pickers/placers towards the central picker and, as has been mentioned above, at the same time the radial length of the central picker/placer viewed from the shaft 29 will be lengthened. After the frame arrangement 13 has been pivoted or tilted to the position according to Figure 9, the spacing between the tubes is thus identical to the spacing on the conveyor 12, and at the same time the circle configuration, in which the tubes originally lie according to Figure 5, has been converted to a rectilinear configuration. During the pivoting of the frame arrangement 13, the original configuration in

the form of an arc of a circle is successively straightened out and the axially acting guides will compensate for the height difference between the central picker/placer and the two outer pickers/placers, so as finally, and in a well-ordered manner, by means of the frame arrangement, to allow the tubes to be placed in the cases on the conveyor 12.

Each picker/placer has a cup-shaped recess 28a adapted to the contour of the tubes, and the tubes are fixed in position by means of vacuum attachments 28b all the way from pick-up according to Figure 5 to release according to Figure 9. This provides positive in-built security against failure and gives the exact position of each tube throughout the entire process.

For those aspects of the transfer process which have not already been discussed above, reference is made to Figures 5 to 12 which show a complete transfer cycle.

Thus, in Figure 5, filled tubes are picked up from a partially circular path of an intermittently operating tube filler, three tubes at a time. The pickers/placers 28 have in this case a positioning corresponding to the partially circular configuration of the tubes, with the central picker/placer drawn back by turning about the articulation 33 (Fig. 4). The frame arrangement 13 is in the position shown in Figure 6. The vacuum is established via attachments 28b and the cavities 28a engage the tubes via elastic inserts 28d (Fig. 1) after these have been lifted by ejectors (not shown) in tube holders 28c in the filler 11.

Figure 7 shows an intermediate position during the pivoting movement of the frame arrangement 13 forwards to the position according to Figure 9. In this intermediate position, the axially acting cam guide 32, by turning about the axis of rotation 17, has effected a 5° turn of the frame arrangement 13 anti-clockwise from the line 35. The frame arrangement, with the pickers/placers arranged thereon, is thus in a starting position for commencement of an

acceleration movement in the clockwise direction under the control of the axially acting cam guide 32. By suitable design of the latter, it has been found that a 5° turn about the axis of rotation 17 is sufficient for the pickers/placers to assume a peripheral speed, in the position according to Figure 9, corresponding to the speed of the conveyor 12. Since the spacing between the pickers/placers corresponds to the spacing of the cases on the conveyor, and in addition since the tubes are oriented in a straight line, these tubes can be easily dropped into the respective case by interrupting the vacuum to the attachments 28b.

Figure 8 shows, in a side view, the position of the frame arrangement 13 and associated parts.

As has already been mentioned, the tubes in the position according to Figure 9 are oriented horizontally and with the necessary spacing, and the frame arrangement 13 is in the position shown in Figure 10.

After the tubes have been released, the frame arrangement 13 gradually assumes a position according to Figure 11. This position represents an intermediate position in which the frame arrangement 15 has been turned about the axis of rotation 17 by means of the axially acting cam guide in order, during a turning movement of 5°, to permit deceleration of the turning movement of the frame about the axis of rotation 17.

After this intermediate position, the frame arrangement and associated parts return to the positions which are shown in Figure 1. Although the pivoting/tilting movement of the frame arrangement is shown in different phases in Figures 1 to 11, it will of course be appreciated that this movement takes place in one sequence and very quickly. Since the tubes are held in place positively throughout the entire pattern of movement, secure and correct handling is guaranteed at very high speeds.

Although the invention has been described with reference to one illustrative embodiment, it will be appreciated that the inventive concept according to the attached patent claims can be applied in contexts other than packaging tubes. For example, the transfer arrangement can be used between all sorts of units in a packaging line where synchronizing between different patterns of movement is required. However, an important feature in this connection is that the container pickers/placers are given a suitable acceleration course at the final stage in order to achieve the desired synchronizing. The tubes do no necessarily need to be tilted from a vertical to a fully horizontal position, from pick-up to release, although this is preferable.

The invention is thus limited only by what is set out in the attached patent claims.

PATENT CLAIMS

1. Method for transferring packaging containers (27) from a first unit (11) operating intermittently in a first horizontal path to a second unit (12) operating continuously in a second horizontal path, characterized in that a plurality of container pickers/placers (28) are arranged on a frame arrangement (13) which can be pivoted from the container pick-up position forwards to the container release position and back to the container pick-up position, about a horizontal axis (16), in that the frame arrangement with the container pickers/placers (28) is made to grip a number of containers (27) in the horizontal path of the first unit, in that the frame arrangement (13), during its pivoting movement to the container release position, is made to execute an accelerating movement about a vertical axis (17), and in that the acceleration is effected in such a way that the speed of the container pickers/placers (28) in the release position corresponds to the continuous speed of the second unit.

2. Method according to Claim 1, characterized by the additional step in which, during the said pivoting movement of the frame arrangement (13) forwards to the container release position, the container pickers/placers (28) are moved to a mutual spacing corresponding to the mutual container spacing, separation, in the second unit.

3. Method according to Claim 2, in which the first path comprises a partially circular part and the containers are picked up from this, characterized by the additional step in which, during the said pivoting movement, differences in height, arising from the pivoting movement, between the containers picked up from the partially circular path are compensated.

4. Method according to any of Claims 1 to 3, in which the containers are oriented vertically in the first path, characterized in that the

said container pickers/placers (28) are arranged to be able to pivot in the said frame arrangement (13) about a second horizontal axis (31) parallel to the first-mentioned axis (16), and in that the pivoting movement about the second axis in combination with the pivoting movement about the first horizontal axis has the effect that the containers arrive horizontally at the second path.

5. Method according to Claim 1, for transferring filled tubes from a tube filler, operating in a horizontal, at least partially circular path and provided with a plurality of filling nozzles, to a continuously operating cartoning machine, characterized in that a plurality of tube pickers/placers (28) are arranged on said frame arrangement (13) which can pivot from the tube pick-up position forwards to the tube release position and back to the tube pick-up position, about said horizontal axis (16), in that the frame arrangement with the tube pickers/placers (28) is made to grip a number of filled tubes in the said at least partially circular path of the tube filler, in that the frame arrangement, during its pivoting movement to the tube release position, is made to execute an accelerating movement about said vertical axis (17), in that the acceleration is effected in such a way that the speed of the tube pickers/placers in the release position corresponds to the speed of the cartoning machine, and in that, during the said pivoting movement of the frame arrangement (13) to said tube release position, the tube pickers/placers (28) are moved to a mutual spacing corresponding to the spacing in the cartoning machine, and differences in height, arising from the pivoting movement, between the tubes picked up from the particularly circular path are compensated.

6. Method according to Claim 5, characterized in that the said tube pickers/placers (28) are arranged to be able to pivot in the said frame arrangement (13) about a second horizontal axis (31) parallel to the first-mentioned horizontal axis (16), and in that the pivoting movement about the second horizontal axis (31) in combination with the pivoting movement about

the first horizontal axis (16) is effected such that the tubes arrive horizontally at the cartoning machine.

7. Method according to Claim 5 or Claim 6, characterized in that the tubes are held positively by force by the said pickers/placers (28) during the entire pivoting movement of the frame arrangement forwards to the release position.

8. Method according to one or more of Claims 5 to 7, characterized in that the frame arrangement, during a first phase of its pivoting movement, is pivoted to an intermediate position (Fig. 7), in that the frame arrangement during this first phase of movement is turned a predetermined angle about the said vertical axis (17), and in that the frame arrangement, during a succeeding second phase of its pivoting movement, forwards to the tube release position, is made to execute the said accelerating movement during a turning movement in a direction counter to the first, but with the same angle of turning.

9. Method according to one or more of Claims 5 to 8, characterized in that after releasing the filled tubes to the cartoning machine, the frame arrangement is made to carry out a pattern of movement inverse to the pattern of movement leading to the release position, involving deceleration of the turning movement about the vertical axis (17), resetting of the frame arrangement (13) to the starting position relative to the vertical axis (17) and the horizontal axes (16, 31), and resetting of the tube pickers/placers (28) to the starting position.

10. Method according to one or more of Claims 5 to 9, characterized in that all the movements are generated by mechanically operated cam guides.

11. Method according to one or more of Claims 5 to 10, characterized in that the tube is gripped, held and released by means of tube pickers/placers (28) operating with vacuum.

12. Arrangement for transferring filled tubes from a tube filler, operating intermittently in a horizontal and at least partially circular path and provided with a plurality of filling nozzles, to a continuously operating cartoning machine, characterized by a frame arrangement (13) which is supported in a stand outside the filler's at least partially circular path, can pivot about a horizontal axis (16) and can turn about a vertical axis (17), tube pickers/placers (28) arranged in the frame arrangement,
an arrangement (26, 25, 21, 20, 19) for generating the pivoting of the frame arrangement (13) from the tube pick-up position (fig. 5) forwards to the release position (fig. 9) and back to the tube pick-up position, an arrangement (26, 32, 32b, 32c) for turning the frame arrangement about the said vertical axis (17) for generating an acceleration course for the said tube pickers/placers (28) during the pivoting movement of the frame arrangement (13) forwards to the tube release position, and an arrangement (32a, 32b) for triggering and controlling the said acceleration over the said acceleration course so that the tube pickers/placers are synchronized with the cartoning machine.

13. Arrangement according to Claim 12, characterized by means (34) which, during the pivoting movement of the frame arrangement (13) to the tube release position (fig. 9), move the tube pickers/placers (28) to a mutual spacing corresponding to the spacing in the cartoning machine, and means (33) for compensation of differences in height, occasioned by the pivoting movement, between the tubes picked up from the said at least partially circular path of the filler, in such a way that a set of tubes lying in a straight line is released to the cartoning machine.

14. Arrangement according to Claim 13, characterized in that the arrangement for the pivoting movement of the frame arrangement comprises a radially acting cam guide (25) driven by a drive shaft (26) mounted in the stand (10), and in that the arrangement for the turning movement of the frame arrangement (13) comprises an axial cam guide (32) driven by the same drive shaft (26).

15. Arrangement according to Claim 14, characterized in that the tube pickers/placers (28) are supported pivotably in the frame arrangement on a second horizontal shaft (29) defining a second pivot axis (31), parallel to the first-mentioned horizontal axis (16).

16. Arrangement according to Claim 15, characterized in that a spring-loaded articulated rod (20) is driven for vertical upward and downward movement from the said drive shaft (26) via the radial cam guide (25) and is connected in an articulated manner to a rotationally fixed arm (19) on a horizontal shaft (18) which supports the frame arrangement in a pivotable manner and defines the said first axis (16).

17. Arrangement according to Claim 16, characterized in that the frame arrangement has a vertical shaft, defining the said vertical axis (17), connected in a rotationally fixed manner to a second arm (32c) controlled by the axial cam guide (32).

18. Arrangement according to one or more of Claims 16 to 17, characterized in that a cam belt (30) is arranged to transmit the movement of the articulation rod (20) from the first supporting horizontal shaft (18) to the second supporting horizontal shaft (29).

19. Arrangement according to Claim 18, characterized in that the second supporting horizontal shaft (29) has axial guides (34) for heels supporting the tube pickers/placers, and in that these guides are adapted in

such a way that the turning of the said second supporting horizontal shaft (29), generated by the cam belt, during the pivoting movement of the frame arrangement (13) forward to the tube release position, sets the tube pickers/placers in a position corresponding to the spacing in the cartoning machine.

20. Arrangement according to Claim 19, characterized in that at least one of the heels is articulated (33) for the purpose of generating the said height compensation.

21. Arrangement according to Claim 20, characterized in that a guide means extending parallel to the second supporting horizontal shaft (29), provided with the said axial guide (34), is intended to control the heels.

22. Arrangement according to Claim 21, characterized in that three tube pickers/placers (28) are supported by the said second supporting horizontal shaft (29) and said guide, of which the central picker/placer is fixed, centrally positioned and articulated (33) parallel to the said horizontal pivoting axes (16, 31), while the outer pickers/placers can be axially displaced by means of the said axial guide (34).

23. Arrangement according to Claim 22, characterized in that the articulation (33) is designed in such a way that, in the pick-up position, the central tube picker/placer and the two outer tube pickers/placers lie on an imaginary arc of a circle corresponding to the partially circular filler path.

24. Arrangement according to Claim 23, characterized in that each tube picker/placer has a cupped tube-securing surface (28a) provided with vacuum openings.

25. Arrangement according to Claim 24, characterized in that vacuum attachments (28b) to the said tube-securing surface are arranged to

be active during the entire pivoting movement of the frame arrangement (13) from pick-up position to release position.

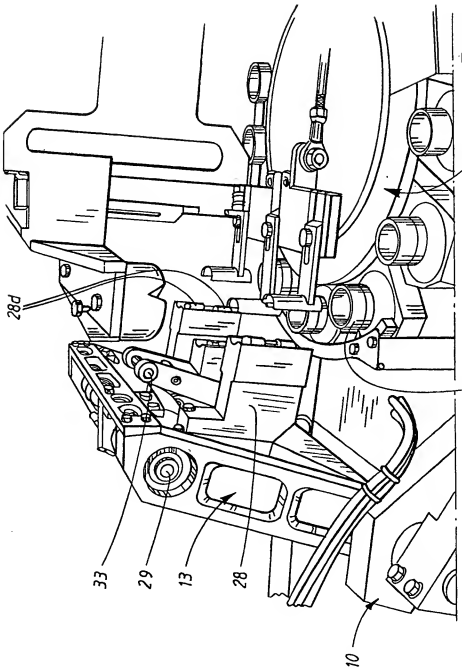

FIG.1

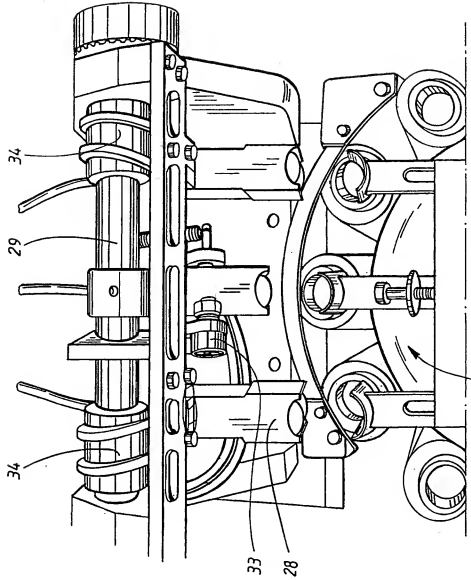

FIG.2

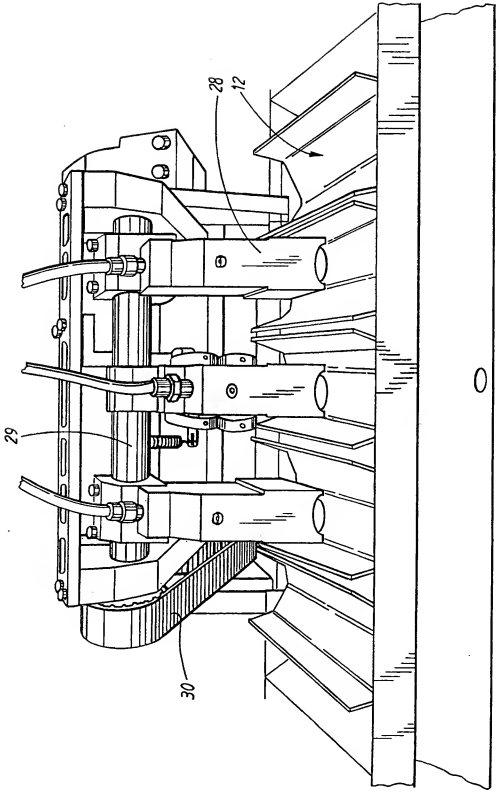

FIG 3

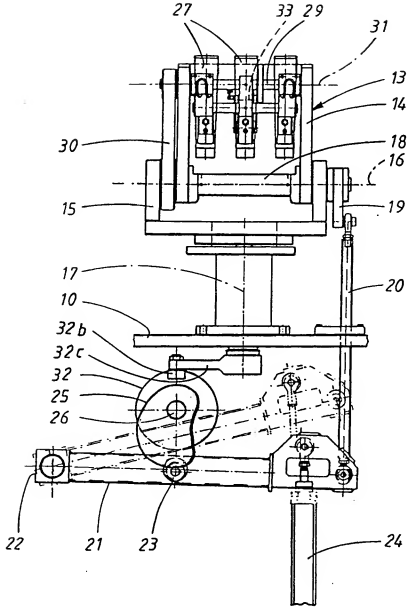

FIG. 4

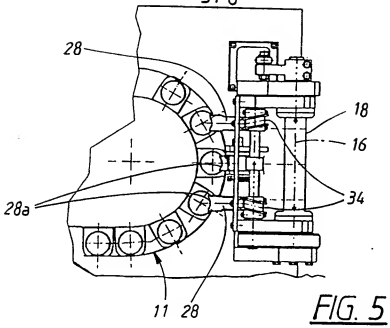

FIG. 5

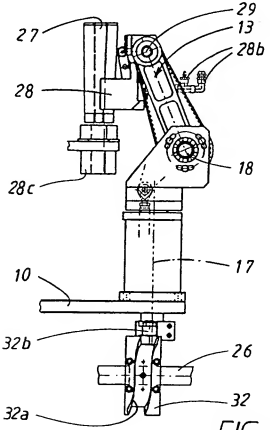

FIG. 6

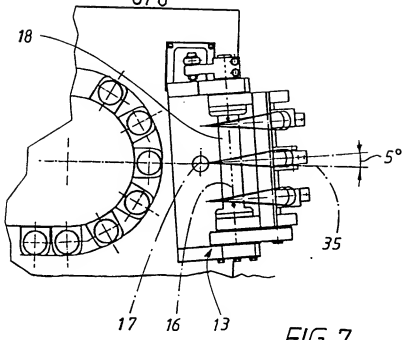

FIG. 7

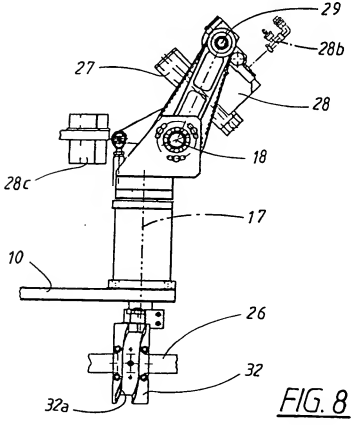

FIG. 8

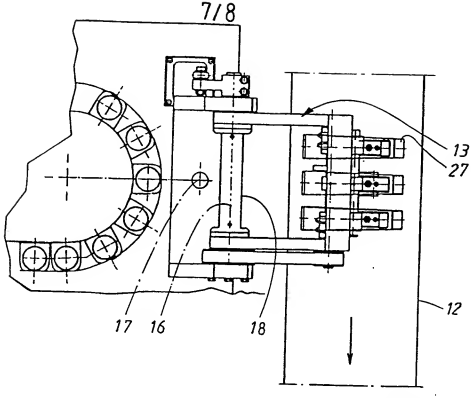

FIG. 9

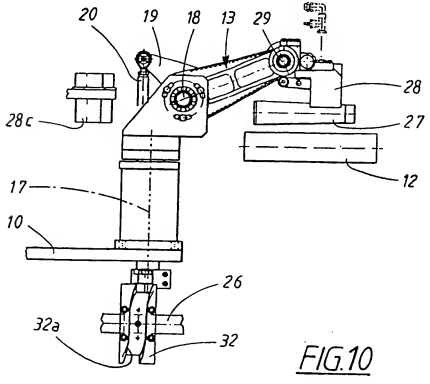

FIG.10

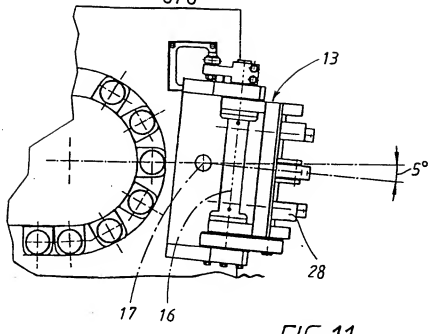

FIG.11

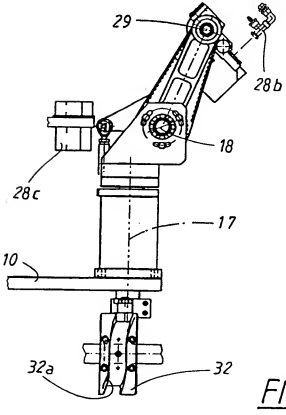

FIG.12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00782

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B65B 35/36, B65B 35/38
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B65B, B66H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 4051652 A (HIRANO ET AL), 4 October 1977 (04.10.77) --	
A	US 5611193 A (FARRELLY), 18 March 1997 (18.03.97) --	
A	US 4827692 A (FISKE ET AL), 9 May 1989 (09.05.89) --	
A	US 3729888 A (CARLE), 1 May 1973 (01.05.73) --	

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 July 2000	2000 -07- 24
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Anette Hall / MRo Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
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